

**Claims:**

5 1. A system for prediction and treatment of all kinds of slugs being formed in a flow line (20) system or wellbore tubing transporting a multiphase fluid towards a downstream process including at least one separator or slug catcher (8) at said process inlet,

**characterised in that**

10 said system comprises:

- a slug detector (1) dedicated to detect any incoming slug which is located downstream of the point of slug initiation and upstream of said process inlet,

- a computer unit (4) connected to said flow line (20) and said downstream process including software which based on signals from said slug detector (1) in combination with either a multiphase flow meter (5) or a fluid velocity meter located upstream of an inlet choke (19) in said process determines the nature of said slug and estimates its volume and its arrival time to said process,

20 - instruments continuously monitoring pressure and liquid levels in said separator or slug catcher,

- at least one device connected to said separator or slug catcher which receives signals from said computer unit (4) to regulate the pressure and/or liquid level in said separator or slug catcher so that process perturbations due to incoming slugs are reduced to a minimum through said process.

2. A system according to claim 1,

**characterised in that**

30 said instruments comprise at least one liquid level transmitter (9,11,18) and/or at least one pressure transmitter (3,16) mounted to said separator or slug catcher.

3. A system according to claim 1,  
**characterised in that**  
said device comprises at least one valve (6,7,12,17) and/or at least one  
5 compressor (14) and/or at least one pump (15).
4. A system according to claim 1,  
**characterised in that**  
said slug detector (1) comprises instruments in said flow line (20) for  
10 measuring flowing pressure, fluid mixture density and at least gas void  
fraction or water cut or local hold-up.
5. A system according to claim 1,  
**characterised in that**  
15 the distance (2) from the slug detector (1) to the downstream process is for  
every new implementation optimised with respect to slug treatment  
capabilities of said process and the parameter settings of all regulating  
devices being controlled by said computer unit (4).
- 20 6. A system according to claim 1,  
**characterised in that**  
the optimum location for said detector (1) could either be in said flow line (20)  
some distance (2) upstream of said process or within a riser (13).
- 25 7. A system according to claim 1,  
**characterised in that**  
the computer unit (4) includes three options for defining the fluid velocities; by  
manual input, by on-line registration using clamp-on fluid velocity meter or by  
including an on-line transient simulator in combination with a multiphase  
30 meter (5) at the flow line outlet.

8. A system according to claim 1,

**characterised in that**

the computer unit (4) integrates said flow line system (20) and said downstream process by adjusting the pressure and liquid level regulating devices based on arrival slug information.

5 9. A system according to claim 1,

**characterised in that**

10 the computer unit (4) comprises override functions that override or suppress the slug control regulation of the downstream process if the trip levels of the separators are approached.

10. A method for prediction and treatment of all kinds of slugs being formed in a

15 flow line (20) system or wellbore tubing transporting a multiphase fluid towards a downstream process including at least one separator or slug catcher (8) at said process inlet,

**characterised in that**

said method comprises the following steps:

20 said slug is detected downstream of the point for slug initiation in said flow line

(20) and upstream said process inlet by means of a slug detector (1),

25 the nature of said slug is determined by means of a computer unit (4) continuously receiving signals from said slug detector (1) in combination with either a fluid velocity meter or a multiphase flow meter (5) located upstream of an inlet choke (19) in said process,

30 the volume of said slug and its arrival time to said process are estimated by said computer unit (4),

pressures and liquid levels in said separator or slug catcher are monitored by said computer unit (4) by means of instruments (3,9,11,16,18) mounted to said separator or slug catcher,

35 said computer unit (4) gives signals to at least one device (6,7,12,14,15,17) connected to said separator or slug catcher to regulate the pressure and/or liquid level in said separator or slug catcher so that process perturbations due to incoming slugs are reduced to a minimum through said process.

11. A method according to claim 9,  
**characterised in that**  
said slug detector records continuously flowing pressure, fluid mixture density and at least gas void fraction or water cut or local hold-up.

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12. A method according to claim 9,  
**characterised in that**  
said pressure and/or liquid levels are regulated by means of at least one valve (6,7,12,17) and/or at least one compressor (14) and/or at least one pump (15)  
10 connected to said separator or slug catcher.

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13. A method according to claim 9,  
**characterised in that**  
said pressure regulation is achieved by adjusting choke opening of at least  
15 one gas outlet valve (6,17) or by adjusting the speed of a downstream compressor (14).

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14. A method according to claim 9,  
**characterised in that**  
20 said liquid level regulation is achieved by adjusting choke opening of at least one liquid outlet valve (7,12) or by adjusting the speed of a down-stream pump (15).

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15. A method according to claim 9,  
**characterised in that**  
25 the flow rate in said flow line is adjusted by means of said inlet choke (19).

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16. A method according to claim 9,  
**characterised in that**  
30 in addition to receiving information from said slug detector the computer unit receives information from instruments (3,9,11,16,18) in said process needed for regulation of pressure and liquid levels in said separator or slug catcher.

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